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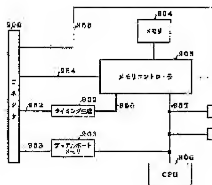
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## (54) IMAGE PROCESSOR

(57)Abstract:

**PURPOSE:** To provide the image processor with which the inclination of an original can be easily corrected, the precision of document processing at an external device can be improved and the burden of processing on the outside can be reduced by providing a means to detect the inclination of an image and a means to rotate the image at any arbitrary angle.

**CONSTITUTION:** A multilevel image signal transmitted from a computer is inputted from a connector 900 to an image memory part, inputted to a memory controller 905 and stored in a memory 904. Corresponding to the command of a CPU 906, an inclination detection circuit 907 detects the inclination angle of the image stored in the memory 904 and transmits the result to the CPU 906. Corresponding to the command of the CPU 906, a rotating circuit 908 rotates the image stored in the memory 904 so that the inclination angle can be corrected. The CPU 906 successively reads the image information from the memory 904 and transfers it to a



dual port memory 903. Then, the external device reads the image information from the dual port memory 903 through a signal line 953 and the connector 900.

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**CLAIMS**

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[Claim(s)]

[Claim 1]An image processing device rotating a picture by an image rotation means and outputting a rotated picture to a picture output means so that bias of a picture may be detected and detected bias may be amended by a skewing detecting means to a picture which was provided with the following, and it was inputted from said image input means, and was memorized to an image storing means.

An image input means which inputs a picture.

A memory measure which memorizes an inputted image.

A detection means to detect bias of an inputted image.

An image rotation means to perform arbitrary rotation of a picture, and a picture output means which performs an output of a picture.

[Claim 2]An image processing device characterized by said image input means being an optical imaging reader in claim 1.

[Claim 3]An image processing device characterized by said image input means being what has an interface means with an external device and inputs a picture from an external device in claim 1.

[Claim 4]An image processing device characterized by said picture output means being a printer in claim 1.

[Claim 5]An image processing device characterized by said picture output means being what has an interface means with an external device and outputs a picture to an external device in claim 1.

[Claim 6]An image processing device which is provided with the following, memorizes a picture read by said image reading means to an image storing means, and is characterized by outputting to an external device by an interface means after rotating at an angle beforehand specified by an image rotation means.

An image reading means which reads a manuscript picture.

A memory measure which memorizes the read picture.

An image rotation means to perform arbitrary rotation of a picture.

An interface means with an external device.

**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the image processing device which performs the rotating process of a picture.

[0002]

[Description of the Prior Art] In recent years, by fast development of the information processor, the advanced creation with the personal level of a document is attained, and the demand is also increasing. In connection with it, the picture was read with image readers, such as a scanner, and the opportunity to process it and include in a document has also increased.

[0003] A character is recognized, it has also become possible now to change into a code (this is generally called "OCR") from the read manuscript, and handling of the manuscript is good further.

[0004]

[Problem(s) to be Solved by the Invention] However, when trying to perform OCR and bias is being carried out more greatly than an angle with a manuscript, the character of each for recognizing could not be started and it has not recognized as a result. Accuracy, such as level nature, has come to be required also of the picture to read by the demand to an advanced text editing.

[0005] Therefore, in such a case, when covering a manuscript over a reader, level nature etc. had to be taken care dramatically.

[0006] Since it was rotating within the computer once it read the picture into the computer even when only the picture which made suitable angles (90 degrees, 180 etc. degrees, etc.) rotate the read picture was required, time and effort was taken dramatically and there was much futility.

[0007] The purpose of this invention is as follows.

Amend the bias of a manuscript easily and raise the word-processing accuracy in an external device.

Provide the image processing device which can ease the burden [ outside ] of processing.

[0008]

[Means for Solving the Problem] This invention can raise accuracy of a picture by forming a bias detection means of a picture, and an image rotation means by which a picture can be rotated at arbitrary angles in an image reader, making it rotate detected bias, and amending. Thereby, when setting a manuscript in an image reader, time and effort for an operator to become sensitive to bias of a picture and set a manuscript properly can be reduced, and accuracy of subsequent processing (for example, OCR) can be raised further.

[0009] Since an angle considered as a user's request is rotated by an image rotation means, time and effort and futility by the side of a computer are mitigable by transmitting to a computer.

[0010]

[Example] Drawing 1 is a block diagram showing the composition of the image forming system in which one example of this invention is shown.

[0011] In drawing 1, the reader section 1 is a picture input device which changes a manuscript into image data.

The printer section 2 is an image output device which has two or more kinds of recording paper cassettes, and outputs image data in the record paper as a visible image by a printing instruction.

[0012] It is electrically connected with the reader section 1, and the external device 3 has various

kinds of functions. Namely, accumulate the information from the computer interface part 7 for connecting with a computer, and the reader section 1 in this external device 3, or. It has the core part 10 grade which controls the image memory part 9 and each above-mentioned function for accumulating temporarily the information sent from the computer.

[0013]Hereafter, the function of each part is explained in detail.

[0014]First, the reader section 1 is explained.

[0015]Drawing 2 is a sectional view showing the composition of the reader section 1 and the printer section 2.

[0016]One manuscript accumulated on the manuscript feeding device 101 is conveyed at a time on the manuscript stand glass surface 102 one by one. And if a manuscript is conveyed to the prescribed position of the glass surface 102, the lamp 103 of a scanner part will light up, and the scanner unit 104 will move, and it will irradiate with a manuscript. The catoptric light of a manuscript is inputted into the CCD series part 109 (henceforth CCD) via the mirrors 105, 106, and 107 and the lens 108.

[0017]Drawing 3 is a block diagram showing the composition of the digital disposal circuit of the above-mentioned reader section 1.

[0018]Photoelectric conversion of the catoptric light of the manuscript irradiated by CCD109 is carried out here, and it is changed into red, green, and the electrical signal of each blue color.

The color information from CCD109 is amplified according to the input signal level of A/D converter 111 with the following amplifiers 110R, 110G, and 110B.

[0019]The output signal from A/D converter 111 is inputted into the shading circuits 112, and the luminous-intensity-distribution nonuniformity of the lamp 103 and the sensitivity unevenness of CCD are amended here. The signal from the shading circuits 112 is inputted into Y-signal generation, the color detection circuit 113, and the external I/F switching circuit 119.

[0020]Y-signal generation and the color detection circuit 113 calculate by the following formulas about the signal from the shading circuits 112, and obtains a Y signal.

[0021]In a  $Y=0.3R+0.6G+0.1B$  pan, it separates into seven colors from the signal of R, G, and B, and has a color detection circuit which outputs the signal over each color. The output signal from Y-signal generation and the color detection circuit 113 is inputted into variable power and the repeat circuit 114. The scanning speed of the scanner unit 104 performs variable power of a vertical scanning direction, and variable power and the repeat circuit 114 perform variable power of a scanning direction. It is possible to output two or more identical images by variable power and the repeat circuit 114.

[0022]An outline and the edge enhancement circuit 115 acquire edge enhancement and profiling information by emphasizing the high frequency component of the signal from variable power and the repeat circuit 114. The signal from an outline and the edge enhancement circuit 115 is patternizing - Fattened with a marker area judging and the outline generating circuit 116, and is inputted into - masking trimming circuit 117.

[0023]A marker area judging and the outline generating circuit 116 read the portion written with the marker pen of the specified color on a manuscript, and generates a marker's profiling information, the next patternizing - Fattens it, and it is - masking trimming circuit 117, and it is fattened from this profiling information, and performs \*\* masking and trimming. It patternizes with the color detecting signal from Y-signal generation and the color detection circuit 113.

[0024]It is made to grow fat and the output signal from - masking trimming circuit 117 changes patternizing and the signal by which various processing was inputted and carried out to the laser driver circuit 118 into the signal for driving laser. The output signal of the laser driver 118 is

inputted into the printer 2, and image formation is performed as a visible image.

[0025]Next, the external I/F switching circuit 119 which performs I/F with an external device is explained.

[0026]When outputting picture information to the external device 3 from the reader section 1, the external I/F switching circuit 119 is patternizing - Fattened, and outputs the picture information from - masking trimming circuit 117 to the connector 120.

[0027]When inputting the picture information from the external device 3 into the reader section 1, the external switching circuit 119 inputs the picture information from the connector 120 into Y-signal generation and the color detection circuit 113.

[0028]The area generating circuit 121 generates various timing signals required for described image processing with the value which each of above-mentioned image processing was performed by directions of CPU122, and was set up by CPU123. Communication with the external device 3 is performed using the communication function built in CPU122. SUBCPU123 performs communication with the external device 3 using the communication function built in SUBCPU123 while controlling the final controlling element 124.

[0029]Next, with reference to drawing 2, the composition and operation of the printer section 2 are explained.

[0030]The picture signal inputted into the printer section 2 is changed into the lightwave signal modulated by the control exposure 201, and irradiates with the photo conductor 202. The latent image made by this irradiation light on the photo conductor 202 is developed by the development counter 203. The tip and timing of the above-mentioned developed image are doubled, a transfer paper is conveyed from the transfer paper base of pallet 204 or 205, and the image developed [ above-mentioned ] is transferred in the transfer section 206.

[0031]After a transfer paper is fixed to the transferred image in the fixing part 207, it is discharged by the device exterior from the delivery unit 208. The transfer paper outputted from the delivery unit 208 is discharged by the top bottle of a sorter when it is discharged by each bottle when the sorting function is working with the sorter 220, and the sorting function is not working.

[0032]Then, how to output the picture read one by one to both sides of the output paper of one sheet is explained.

[0033]Once, for [ after conveyance and a paper ] conveyances is reversed to the delivery unit 208, and the output paper to which it was fixed in the fixing part 207 is conveyed via the transportation direction change member 209 to the transferred paper base of pallet 210 for paper re feeding. Since paper will be fed about a transfer paper from the transferred paper base of pallet 210 for paper re feeding although a manuscript picture as well as the above-mentioned process is read if the following manuscript is prepared, the manuscript picture of two sheets can be outputted to the surface of the same output paper, and a rear face after all.

[0034]Next, the external device 3 is explained. It is connected with the reader 1 by a cable, and the external device 3 performs control of a signal, and control of each function by the core part in the external device 3.

[0035]The computer interface part 7 which performs an interface with a computer in this external device 3, The core part 10 grade which controls the image memory part 9 and each above-mentioned function for accumulating the information from the reader section 1, or accumulating temporarily the information sent from the computer is provided.

[0036]First, the core part 10 is explained.

[0037]Drawing 4 is a block diagram showing the detailed composition of the above-mentioned

core part 10.

[0038]The connector 1001 of the core part 10 is connected by the connector 120 and cable of the reader section 1. Four kinds of signal wires are built in this connector 1001.

The signal wire 1057 is a video signal line of an 8-bit multiple value.

The signal wire 1055 is a controlling signal line which controls a video signal. The signal wires 1051 are CPU122 in the reader 1, and a signal wire which performs communication.

The signal wires 1052 are SUBCPU123 in the reader 1, and a signal wire which performs communication.

[0039]And communications protocol processing of the signal wire 1051 and the signal wire 1052 is carried out by IC1002 for communication, and they transmit communication information to CPU1003 via CPU1053.

[0040]The signal wire 1057 is a bidirectional video signal line.

It is possible to receive the information from the reader section 1 by the core part 10 or to output the information from the core part 10 to the reader section 1.

[0041]It is connected to the buffer 1010 and this signal wire 1057 is separated into the signal wire 1058 and the signal wire 1070 of a signal of a uni directional from a bidirectional signal here.

[0042]The signal wire 1058 is a signal wire of the video signal of the 8-bit multiple value from the reader section 1, and outputs the video signal of an 8-bit multiple value to LUT1011 of the next step. In LUT1011, the picture information from the reader section 1 is changed into the value for which it asks by a look-up table. The signal of the output signal line 1059 from LUT1011 is inputted into the binarization circuit 1012 or the selector 1013.

[0043]In the binarization circuit 1012, it has a simple binarization function which carries out binarization of the signal of the multiple value of the signal wire 1059 with fixed slice level, a binarization function by the change slice level to which slice level is changed from the value of the surrounding pixel of an order pixel, and a binarization function by an error diffusion method. The information by which binarization was carried out is changed into the multi valued signal of FFH at the time of 00H and 1 at the time of 0, and is inputted into the selector 1013 of the next step. The selector 1013 chooses an output signal paddle gap of the signal from LUT1011 or the binarization circuit 1012. The signal of the output signal line 1060 from the selector 1013 is inputted into the selector 1014.

[0044]The signal of the signal wire 1064 of the signal with which the video signal output from the computer interface part 7 and the image memory part 9 was inputted into the selector 1014 by the core part 10 via the connectors 1007 and 1009, respectively, The signal of the output signal line 1060 of the selector 1013 is chosen with directions of CPU1003.

[0045]The signal of the output signal line 1061 of the selector 1014 is inputted into the rotary circuit 1015 or the selector 1016. The rotary circuit 1015 has the function to rotate the inputted picture signal at +90-90 degrees and +180 degrees. After the rotary circuit 1015 changes into a binary signal the information outputted from the reader section 1 in the binarization circuit 1012, it is memorized as information from the reader section 1 to the rotary circuit 1015.

[0046]Next, the rotary circuit 1015 rotates and reads the memorized information with the directions from CPU1003. The selector 1016 chooses one of the signals of the output signal line 1062 of the rotary circuit 1015, and the input signal line 1061 of the rotary circuit 1015, and as a signal of the signal wire 1063, It outputs to the connector 1007 with a computer interface part,

the connector 1009 with the image memory part 9, and the selector 1017.

[0047]The signal wire 1063 is a uni-directional video bus of 8 bits of synchronous methods which transmit picture information to the computer interface part 7 and the image memory part 9 from the core part 10.

The signal wire 1064 is a uni-directional video bus of 8 bits of synchronous methods to which picture information is transmitted from the computer interface part 7 and the image memory part 9.

[0048]The video control circuit 1004 is controlling the synchronous method bus of the above-mentioned signal wire 1063 and the signal wire 1064, and it controls by the signal of the output signal line 1056 from the video control circuit 1004. The signal wire 1054 is elsewhere connected to the connector 1007 and the connector 1009, respectively.

[0049]The signal wire 1054 is a bidirectional 16-bit CPU bus.

The exchange of the data based on asynchronous and a command is performed.

Transmission of the information on the computer interface part 7, the image memory part 9, and the core part 10 is possible by two above-mentioned video bus 1063 and 1064 and CPU1054.

[0050]The signal of the signal wire 1064 from the computer interface part 7 and the image memory part 9 is inputted into the selector 1014 and the selector 1017. The selector 1014 inputs the signal of the signal wire 1064 into the rotary circuit 1015 of the next step with directions of CPU1003.

[0051]The selector 1017 chooses either of the signals of the signal wire 1063 and the signal wire 1064 with directions of CPU1003. The output signal line 1065 of the selector 1017 is inputted into the pattern matching circuit 1018 and the selector 1019. The pattern matching circuit 1018 outputs the signal of the multiple value decided beforehand to the signal line 1066, when the pattern and pattern matching which were able to determine the signal of the input signal line 1065 beforehand are performed and a pattern is in agreement. When not in agreement with pattern matching, the signal of the input signal line 1065 is outputted to the signal wire 1066.

[0052]The selector 1019 chooses the signal wire 1065 and the signal wire 1066 with directions of CPU1003. The output signal of the selector 1019 passes along the signal wire 1067, and is inputted into LUT1020 of the next step.

[0053]When LUT1020 outputs picture information to the printer section 2, it changes the signal of the input signal line 1067 according to the characteristic of a printer.

[0054]The selector 1021 chooses either signal of the output signal line 1068 of LUT1020, and the signal wire 1065 with directions of CPU1003. The output signal of the selector 1021 is inputted into the expansion circuit 1022 of the next step.

[0055]The expansion circuit 1022 can set magnifying power as the direction of X, and the direction independence of Y with the directions from CPU1003. The expansion method is the primary linear interpolation method. The output signal of the expansion circuit 1022 is inputted into the buffer 1010 through the signal wire 1070.

[0056]The signal of the signal wire 1070 inputted into the buffer 1010 passes along the bidirectional signal wire 1057 with directions of CPU1003, via the connector 1001, is sent to the printer section 2 and printed out.

[0057]Hereafter, the flow of the signal of the core part 10 and each part is explained.

[0058]First, operation of the core part 10 using the information on the computer interface part 7 is explained.

[0059]The computer interface part 7 performs an interface with the computer connected to the

external device 3. The computer interface part 7 is provided with two or more interfaces which perform communication with SCSI, RS232C, and the Centronics system. The computer interface part 7 has three kinds of above-mentioned interfaces, and the information from each interface is sent to CPU1003 via the connector 1007 and the data bus 1054. CPU1003 performs various kinds of control from the sent contents.

[0060]Next, operation of the core part 10 using the information on the image memory part 9 is explained.

[0061]First, the case where information is outputted to the image memory part 9 is explained.

[0062]Via communication IC1002, CPU1003 performs CPU122 of the reader section 1, and communication, and issues a manuscript scan command. The reader section 1 is read when the scanner unit 104 scans a manuscript with this command, and it outputs picture information to the connector 120. The reader section 1 and the external device 3 are connected by the cable.

The information from the reader section 1 is inputted into the connector 1001 of the core part 10. The picture information inputted into the connector 1001 is sent to LUT1011 via the signal line 1057 of 8 bits of multiple values, and the buffer 1010.

[0063]The output signal of LUT1011 is transmitted to the image memory part 9 as multi valued image information via the signal wire 1059, the selectors 1013, 1014, and 1016, and the connector 1009. The picture information memorized by the image memory part 9 is sent to CPU1003 via CPU bus 1054 of the connector 1009. CPU1003 transmits the data sent to the computer interface part 7 mentioned above from the image memory part 9. The computer interface part 7 is transmitted to a computer with the interface for which it asks among three kinds of above-mentioned interfaces (SCSI, RS232C, Centronics).

[0064]Next, the case where the information from the image memory part 9 is received is explained.

[0065]First, picture information is sent to the core part 10 from a computer via the computer interface part 7. If CPU1003 of the core part 10 judges that the data sent via CPU bus 1054 from the computer interface part 7 is data about the image memory part 9, it will be transmitted to the image memory part 9 via the connector 1009. Next, the image memory part 9 transmits an 8-bit multi valued signal to the selector 1014 and the selector 1017 via the signal wire 1064 via the connector 1009.

[0066]In rotating the picture of the image memory part 9 to the printer section 2 with directions of CPU1003 and outputting, it carries out the rotating process of the signal 1064 inputted into the selector 1014 in the rotary circuit 1015. The output signal 1062 from the rotary circuit 1015 is inputted into LUT1020 via the selector 1016 and the selectors 1017 and 1019. Since LUT1020 outputs the picture of the image memory part 9 to the printer section 2 by the concentration considered as a request, the table of LUT1020 can be changed by CPU1003.

[0067]The output signal 1068 of LUT1020 is inputted into the expansion circuit 1022 via the selector 1021. The expansion circuit 1022 carries out expanding processing of the 8-bit multiple value with the primary linear interpolation method. The 8-bit multi valued signal which has a value from [ many of ] the expansion circuit 1022 is sent to the reader section 1 via the buffer 1010 and the connector 1001.

[0068]The reader section 1 inputs this signal into the external I/F switching circuit 119 via the connector 120. The external I/F switching circuit 119 inputs the signal from the image memory part 9 into Y-signal generation and the color detection circuit 113. After the output signal from Y-signal generation and the color detection circuit 113 is carried out in processing which was described above, it is outputted to the printer section 2 and image formation is performed on an

output paper.

[0069]Next, the computer interface part 7 is explained using drawing 5.

[0070]The connector A700 and the connector B701 are connectors for SCSI interfaces. The connector C702 is a connector for Centronics interfaces. The connector D703 is a connector for a RS232C interface. The connector E707 is a connector for connecting with the core part 10.

[0071]In connecting the apparatus which has two connectors (the connector A700, the connector B701), and has two or more SCSI interfaces, it carries out cascade connection of the SCSI interface using the connector A700 and the connector B701. In connecting a computer with the external device 3 by 1 to 1, a computer is connected with the connector A700 by a cable, and a terminator is connected to the connector B701, or a computer is connected with the connector B701 by a cable, and it connects a terminator to the connector A700.

[0072]The information inputted from the connector A700 or the connector B701 is inputted into SCSI-I/F-A704 or SCSI-I/F-B708 via the signal line 751. SCSI-I/F-A704 or SCSI-I/F-B708 output data to the connector E707 via the signal line 754, after performing procedure by a SCSI protocol.

[0073]The connector E707 is connected to CPU bus 1054 of the core part 10. CPU1003 of the core part 10 receives the information inputted into the connector for SCSI-I/F (the connector A700, the connector B701) from CPU bus 1054.

[0074]When outputting the data from CPU1003 of the core part 10 to a SCSI connector (the connector A700, the connector B701), a procedure contrary to the above performs.

[0075]It is connected to the connector C702 and a Centronics interface is inputted into Centronics I/F705 via the signal line 752. Centronics I/F705 receives data by the procedure of the decided protocol, and outputs it to the connector E707 via the signal line 754.

[0076]The connector E707 is connected to CPU bus 1054 of the core part 10.

CPU1003 of the core part 10 receives the information inputted into the connector for Centronics I/F (connector C702) from CPU bus 1054.

[0077]It is connected to the connector D703 and a RS232C interface is inputted into RS232C and I/F706 via the signal line 753. RS232C and I/F706 receive data by the procedure of the decided protocol, and outputs it to the connector E707 via the signal line 754.

[0078]The connector E707 is connected to CPU bus 1054 of the core part 10.

CPU1003 of the core part 10 receives the information inputted into RS232C and the connector for I/F (connector D703) from CPU bus 1054.

When outputting the data from CPU1003 of the core part 10 to RS232C and the connector for I/F (connector D703), a procedure contrary to the above performs.

[0079]Next, the image memory part 9 is explained based on drawing 6.

[0080]It is connected with the core part 10 by the connector 900, and the image memory part 9 exchanges various signals. The multiple-value input signal 954 is memorized by the memory 904 under control of the memory controller 905.

[0081]The mode in which the memory controller 905 exchanges the data of the memory 904 and CPU bus 957 with directions of CPU906. It has three functions in the mode in which the signal 954 is memorized in the memory 904 under control of the timing generating circuit 902, and the mode which reads the contents from the memory 904 and is outputted to the signal line 955.

[0082]The memory 904 has the capacity of 32Mbytes and memorizes the picture of A three-phase-circuit this with the resolution of 400dpi, and 256 gradation. The timing generating circuit

902 is connected with the connector 900 by the signal line 952.

It is started by the control signal (HSYNC, HEC, VSYNC, VEN) from the core part 10, and the signal for attaining the two following functions is generated.

[0083]The 1st is the function to memorize the information from the core part 10 in the memory 904.

The 2nd is the function to transmit picture information to the read signal line 955 from the memory 904.

[0084]CPU906 of the image memory part 9 is connected to the dual port memory 903 via CPU1003 of the core part 10, and the signal line 957 via the signal line 953. Each CPU exchanges a command via this dual port memory 903.

[0085]By instructions of CPU906, the bias detector circuit 907 detects the bias angle of the picture memorized by the memory 904, and transmits the result to CPU906. The rotary circuit 908 rotates the free angle of the picture memorized by the memory 904 by instructions of CPU. The bias detector circuit 907 and the rotary circuit 908 are mentioned further later.

[0086]Next, picture information is accumulated in the image memory part 9, and the example of operation which transmits this information to a computer is explained. The 8-bit multi value image signal from the reader section 1 is inputted from the connector 900, and is inputted into the memory controller 905 via the signal line 954. With the signal 952 from the core part 10, the memory controller 905 generates the timing signal 956 in the timing generating circuit 902, and memorizes the signal 954 in the memory 904 according to this signal.

[0087]Here, if bias detection is needed, CPU906 will detect a bias angle by the bias detector circuit 907, and will obtain the result. And by the rotary circuit 908, CPU906 rotates the picture memorized by the memory 904 so that a bias angle may be amended.

[0088]CPU906 connects the memory 904 of the memory controller 905 to CPU bus 957.

CPU906 reads image information from the memory 904 one by one, and transmits it to the dual port memory 903. CPU1003 of the core part 10 reads the image information of the dual port memory 903 of the image memory part 9 via the signal line 953 and the connector 900, and transmits this information to the computer interface part 7. Since it has already explained, it omits transmitting information to a computer from the computer interface part 7.

[0089]Next, the example of operation which outputs the image information sent from the computer to the printer section 2 is explained.

[0090]The image information sent from the computer is sent to the core part 10 via the computer interface part 7.

[0091]CPU1003 of the core part 10 transmits image information to the dual port memory 903 of the image memory part 9 via CPU bus 1054 and the connector 1009.

[0092]At this time, CPU906 controls the memory controller 905 and connects CPU bus 957 to the bus of the memory 904.

[0093]CPU906 transmits image information to the memory 904 via the memory controller 905 from the dual port memory 903. If it finishes transmitting image information to the memory 904, CPU906 will control the memory controller 905 and will connect the data line of the memory 904 to the signal 955.

[0094]CPU906 performs CPU1003 of the core part 10, and communication via the dual port memory 903, and performs setting out for carrying out the print output of the picture to the printer section 2 through the core part 10 from the memory 904.

[0095]After this setting out is completed, CPU906 applies starting to the timing generating circuit 902, and outputs a predetermined timing signal to the memory controller 905 from the signal line 956.

[0096]The memory controller 905 reads image information from the memory 904 synchronizing with the signal from the timing generating circuit 902, transmits it to the signal line 955, and is outputted to the connector 900.

[0097]Since the core part 10 explained, it omits, until it outputs to the printer section 2 from the connector 900.

[0098]Hereafter, the bias detector circuit 907 and the arbitrary gyros-angularis revolution way 908 which serve as the feature in the example of this invention are explained.

[0099]Drawing 7 is a flow chart which shows operation of the bias detector circuit 907.

[0100]First, in S1001, the picture is scanned, the connectivity of the black pixel of a picture is investigated, and it expresses with the minimum rectangle that adjoins a linked black pixel (drawing 8). Next, in S1002, a rectangular relation (vertical and horizontal adjoining interval) is investigated, and a document judges vertical writing or lateral writing. And in S1003, if a document is lateral writing and it is a portion under a rectangle, and vertical writing, a right portion will be connected in a straight line, and a bias angle will be obtained, comparing it with the reference horizon or a perpendicular line.

[0101]As other examples of the bias detector circuit 907, level and the line which becomes vertical can be entered in the specific portion of the manuscript to read to a manuscript, it can be read together with a manuscript, the line can be detected in a bias detector circuit, and a bias angle can also be obtained as compared with a reference line.

[0102]In this case, although a line must be written in a manuscript, unlike a previous example, it can respond also to pictures other than a document image.

[0103]Next, the example of the arbitrary gyros-angularis revolution way 908 is explained. This is expressed with the formula of the coordinate conversion shown in drawing 9, when an angle of rotation is set to s.

[0104]First, skewing correction memorizes the picture read by the scanner part 1 to the image memory part 9 through the core part 10, as mentioned above. Here, a bias angle is detected by the bias detector circuit 907, and it rotates so that a bias angle may be amended by the rotary circuit 908. And it is outputted to the interface part 7.

[0105]Proper spin compensation will be automatically performed and outputted about the manuscript which carried out bias delicately by this, and the accuracy of reading in OCR etc. can be improved easily.

[0106]Next, the example of the output of the arbitrary gyros-angularis revolution way 908 is explained.

[0107]First, the picture read by the scanner part 1 is memorized to the image memory part 9 through the core part 10, as mentioned above. Here, only the angle specified beforehand is rotated and it is outputted to the interface part 7 by the rotary circuit 908.

[0108]The angle turning around a picture shall be set up by the predetermined key operation of the final controlling element 124, etc. The accuracy of reading in OCR etc. can be easily improved because this sets up and copies the degree of correction angle arbitrarily about the manuscript which carried out bias.

[0109]

[Effect of the Invention]As explained above, in this invention, it used amending bias and outputting to an external device by establishing a bias detector circuit and a rotary circuit in an

image reader.

There is an effect which raises the word-processing accuracy in an external device, and can ease the burden [ outside ] of processing by that cause.

[0110]In this invention, after rotating the specified angle picture, it used outputting to an external device.

There is an effect which raises the word-processing accuracy in an external device, and can ease the burden [ outside ] of processing by that cause.

## **TECHNICAL FIELD**

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[Industrial Application]This invention relates to the image processing device which performs the rotating process of a picture.

## **PRIOR ART**

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[Description of the Prior Art]In recent years, by fast development of the information processor, the advanced creation with the personal level of a document is attained, and the demand is also increasing. In connection with it, the picture was read with image readers, such as a scanner, and the opportunity to process it and include in a document has also increased.

[0003]A character is recognized, it has also become possible now to change into a code (this is generally called "OCR") from the read manuscript, and handling of the manuscript is good further.

## **EFFECT OF THE INVENTION**

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[Effect of the Invention]As explained above, in this invention, it used amending bias and outputting to an external device by establishing a bias detector circuit and a rotary circuit in an image reader.

There is an effect which raises the word-processing accuracy in an external device, and can ease the burden [ outside ] of processing by that cause.

[0110]In this invention, after rotating the specified angle picture, it used outputting to an external device.

There is an effect which raises the word-processing accuracy in an external device, and can ease the burden [ outside ] of processing by that cause.

## **TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention]However, when trying to perform OCR and bias is being carried out more greatly than an angle with a manuscript, the character of each for recognizing could not be started and it has not recognized as a result. Accuracy, such as level nature, has come to be required also of the picture to read by the demand to an advanced text editing.

[0005]Therefore, in such a case, when covering a manuscript over a reader, level nature etc. had to be taken care dramatically.

[0006]Since it was rotating within the computer once it read the picture into the computer even when only the picture which made suitable angles (90 degrees, 180 etc. degrees, etc.) rotate the read picture was required, time and effort was taken dramatically and there was much futility.

[0007]The purpose of this invention is as follows.

Amend the bias of a manuscript easily and raise the word-processing accuracy in an external device.

Provide the image processing device which can ease the burden [ outside ] of processing.

## MEANS

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[Means for Solving the Problem]This invention can raise accuracy of a picture by forming a bias detection means of a picture, and an image rotation means by which a picture can be rotated at arbitrary angles in an image reader, making it rotate detected bias, and amending. Thereby, when setting a manuscript in an image reader, time and effort for an operator to become sensitive to bias of a picture and set a manuscript properly can be reduced, and accuracy of subsequent processing (for example, OCR) can be raised further.

[0009]Since an angle considered as a user's request is rotated by an image rotation means, time and effort and futility by the side of a computer are mitigable by transmitting to a computer.

## EXAMPLE

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[Example]Drawing 1 is a block diagram showing the composition of the image forming system in which one example of this invention is shown.

[0011]In drawing 1, the reader section 1 is a picture input device which changes a manuscript into image data.

The printer section 2 is an image output device which has two or more kinds of recording paper cassettes, and outputs image data in the record paper as a visible image by a printing instruction.

[0012]It is electrically connected with the reader section 1, and the external device 3 has various kinds of functions. Namely, accumulate the information from the computer interface part 7 for connecting with a computer, and the reader section 1 in this external device 3, or. It has the core part 10 grade which controls the image memory part 9 and each above-mentioned function for accumulating temporarily the information sent from the computer.

[0013]Hereafter, the function of each part is explained in detail.

[0014]First, the reader section 1 is explained.

[0015]Drawing 2 is a sectional view showing the composition of the reader section 1 and the printer section 2.

[0016]One manuscript accumulated on the manuscript feeding device 101 is conveyed at a time on the manuscript stand glass surface 102 one by one. And if a manuscript is conveyed to the prescribed position of the glass surface 102, the lamp 103 of a scanner part will light up, and the scanner unit 104 will move, and it will irradiate with a manuscript. The catoptric light of a manuscript is inputted into the CCD series part 109 (henceforth CCD) via the mirrors 105, 106, and 107 and the lens 108.

[0017]Drawing 3 is a block diagram showing the composition of the digital disposal circuit of the above-mentioned reader section 1.

[0018]Photoelectric conversion of the catoptric light of the manuscript irradiated by CCD109 is

carried out here, and it is changed into red, green, and the electrical signal of each blue color. The color information from CCD109 is amplified according to the input signal level of A/D converter 111 with the following amplifiers 110R, 110G, and 110B.

[0019]The output signal from A/D converter 111 is inputted into the shading circuits 112, and the luminous-intensity-distribution nonuniformity of the lamp 103 and the sensitivity unevenness of CCD are amended here. The signal from the shading circuits 112 is inputted into Y-signal generation, the color detection circuit 113, and the external I/F switching circuit 119.

[0020]Y-signal generation and the color detection circuit 113 calculate by the following formulas about the signal from the shading circuits 112, and obtains a Y signal.

[0021]In a  $Y=0.3R+0.6G+0.1B$  pan, it separates into seven colors from the signal of R, G, and B, and has a color detection circuit which outputs the signal over each color. The output signal from Y-signal generation and the color detection circuit 113 is inputted into variable power and the repeat circuit 114. The scanning speed of the scanner unit 104 performs variable power of a vertical scanning direction, and variable power and the repeat circuit 114 perform variable power of a scanning direction. It is possible to output two or more identical images by variable power and the repeat circuit 114.

[0022]An outline and the edge enhancement circuit 115 acquire edge enhancement and profiling information by emphasizing the high frequency component of the signal from variable power and the repeat circuit 114. The signal from an outline and the edge enhancement circuit 115 is patternizing - Fattened with a marker area judging and the outline generating circuit 116, and is inputted into - masking trimming circuit 117.

[0023]A marker area judging and the outline generating circuit 116 read the portion written with the marker pen of the specified color on a manuscript, and generates a marker's profiling information, the next patternizing - Fattens it, and it is - masking trimming circuit 117, and it is fattened from this profiling information, and performs \*\* masking and trimming. It patternizes with the color detecting signal from Y-signal generation and the color detection circuit 113.

[0024]It is made to grow fat and the output signal from - masking trimming circuit 117 changes patternizing and the signal by which various processing was inputted and carried out to the laser driver circuit 118 into the signal for driving laser. The output signal of the laser driver 118 is inputted into the printer 2, and image formation is performed as a visible image.

[0025]Next, the external I/F switching circuit 119 which performs I/F with an external device is explained.

[0026]When outputting picture information to the external device 3 from the reader section 1, the external I/F switching circuit 119 is patternizing - Fattened, and outputs the picture information from - masking trimming circuit 117 to the connector 120.

[0027]When inputting the picture information from the external device 3 into the reader section 1, the external switching circuit 119 inputs the picture information from the connector 120 into Y-signal generation and the color detection circuit 113.

[0028]The area generating circuit 121 generates various timing signals required for described image processing with the value which each of above-mentioned image processing was performed by directions of CPU122, and was set up by CPU123. Communication with the external device 3 is performed using the communication function built in CPU122. SUBCPU123 performs communication with the external device 3 using the communication function built in SUBCPU123 while controlling the final controlling element 124.

[0029]Next, with reference to drawing 2, the composition and operation of the printer section 2 are explained.

[0030]The picture signal inputted into the printer section 2 is changed into the lightwave signal modulated by the control exposure 201, and irradiates with the photo conductor 202. The latent image made by this irradiation light on the photo conductor 202 is developed by the development counter 203. The tip and timing of the above-mentioned developed image are doubled, a transfer paper is conveyed from the transfer paper base of pallet 204 or 205, and the image developed [ above-mentioned ] is transferred in the transfer section 206.

[0031]After a transfer paper is fixed to the transferred image in the fixing part 207, it is discharged by the device exterior from the delivery unit 208. The transfer paper outputted from the delivery unit 208 is discharged by the top bottle of a sorter when it is discharged by each bottle when the sorting function is working with the sorter 220, and the sorting function is not working.

[0032]Then, how to output the picture read one by one to both sides of the output paper of one sheet is explained.

[0033]Once, for [ after conveyance and a paper ] conveyances is reversed to the delivery unit 208, and the output paper to which it was fixed in the fixing part 207 is conveyed via the transportation direction change member 209 to the transferred paper base of pallet 210 for paper re feeding. Since paper will be fed about a transfer paper from the transferred paper base of pallet 210 for paper re feeding although a manuscript picture as well as the above-mentioned process is read if the following manuscript is prepared, the manuscript picture of two sheets can be outputted to the surface of the same output paper, and a rear face after all.

[0034]Next, the external device 3 is explained. It is connected with the reader 1 by a cable, and the external device 3 performs control of a signal, and control of each function by the core part in the external device 3.

[0035]The computer interface part 7 which performs an interface with a computer in this external device 3, The core part 10 grade which controls the image memory part 9 and each above-mentioned function for accumulating the information from the reader section 1, or accumulating temporarily the information sent from the computer is provided.

[0036]First, the core part 10 is explained.

[0037]Drawing 4 is a block diagram showing the detailed composition of the above-mentioned core part 10.

[0038]The connector 1001 of the core part 10 is connected by the connector 120 and cable of the reader section 1. Four kinds of signal wires are built in this connector 1001.

The signal wire 1057 is a video signal line of an 8-bit multiple value.

The signal wire 1055 is a controlling signal line which controls a video signal. The signal wires 1051 are CPU122 in the reader 1, and a signal wire which performs communication.

The signal wires 1052 are SUBCPU123 in the reader 1, and a signal wire which performs communication.

[0039]And communications protocol processing of the signal wire 1051 and the signal wire 1052 is carried out by IC1002 for communication, and they transmit communication information to CPU1003 via CPU1053.

[0040]The signal wire 1057 is a bidirectional video signal line.

It is possible to receive the information from the reader section 1 by the core part 10 or to output the information from the core part 10 to the reader section 1.

[0041]It is connected to the buffer 1010 and this signal wire 1057 is separated into the signal

wire 1058 and the signal wire 1070 of a signal of a uni directional from a bidirectional signal here.

[0042]The signal wire 1058 is a signal wire of the video signal of the 8-bit multiple value from the reader section 1, and outputs the video signal of an 8-bit multiple value to LUT1011 of the next step. In LUT1011, the picture information from the reader section 1 is changed into the value for which it asks by a look-up table. The signal of the output signal line 1059 from LUT1011 is inputted into the binarization circuit 1012 or the selector 1013.

[0043]In the binarization circuit 1012, it has a simple binarization function which carries out binarization of the signal of the multiple value of the signal wire 1059 with fixed slice level, a binarization function by the change slice level to which slice level is changed from the value of the surrounding pixel of an order pixel, and a binarization function by an error diffusion method. The information by which binarization was carried out is changed into the multi valued signal of FFH at the time of 00H and 1 at the time of 0, and is inputted into the selector 1013 of the next step. The selector 1013 chooses an output signal paddle gap of the signal from LUT1011 or the binarization circuit 1012. The signal of the output signal line 1060 from the selector 1013 is inputted into the selector 1014.

[0044]The signal of the signal wire 1064 of the signal with which the video signal output from the computer interface part 7 and the image memory part 9 was inputted into the selector 1014 by the core part 10 via the connectors 1007 and 1009, respectively. The signal of the output signal line 1060 of the selector 1013 is chosen with directions of CPU1003.

[0045]The signal of the output signal line 1061 of the selector 1014 is inputted into the rotary circuit 1015 or the selector 1016. The rotary circuit 1015 has the function to rotate the inputted picture signal at +90-90 degrees and +180 degrees. After the rotary circuit 1015 changes into a binary signal the information outputted from the reader section 1 in the binarization circuit 1012, it is memorized as information from the reader section 1 to the rotary circuit 1015.

[0046]Next, the rotary circuit 1015 rotates and reads the memorized information with the directions from CPU1003. The selector 1016 chooses one of the signals of the output signal line 1062 of the rotary circuit 1015, and the input signal line 1061 of the rotary circuit 1015, and as a signal of the signal wire 1063, It outputs to the connector 1007 with a computer interface part, the connector 1009 with the image memory part 9, and the selector 1017.

[0047]The signal wire 1063 is a uni-directional video bus of 8 bits of synchronous methods which transmit picture information to the computer interface part 7 and the image memory part 9 from the core part 10.

The signal wire 1064 is a uni-directional video bus of 8 bits of synchronous methods to which picture information is transmitted from the computer interface part 7 and the image memory part 9.

[0048]The video control circuit 1004 is controlling the synchronous method bus of the above-mentioned signal wire 1063 and the signal wire 1064, and it controls by the signal of the output signal line 1056 from the video control circuit 1004. The signal wire 1054 is elsewhere connected to the connector 1007 and the connector 1009, respectively.

[0049]The signal wire 1054 is a bidirectional 16-bit CPU bus.

The exchange of the data based on asynchronous and a command is performed.

Transmission of the information on the computer interface part 7, the image memory part 9, and the core part 10 is possible by two above-mentioned video bus 1063 and 1064 and CPU1054.

[0050]The signal of the signal wire 1064 from the computer interface part 7 and the image

memory part 9 is inputted into the selector 1014 and the selector 1017. The selector 1014 inputs the signal of the signal wire 1064 into the rotary circuit 1015 of the next step with directions of CPU1003.

[0051]The selector 1017 chooses either of the signals of the signal wire 1063 and the signal wire 1064 with directions of CPU1003. The output signal line 1065 of the selector 1017 is inputted into the pattern matching circuit 1018 and the selector 1019. The pattern matching circuit 1018 outputs the signal of the multiple value decided beforehand to the signal line 1066, when the pattern and pattern matching which were able to determine the signal of the input signal line 1065 beforehand are performed and a pattern is in agreement. When not in agreement with pattern matching, the signal of the input signal line 1065 is outputted to the signal wire 1066.

[0052]The selector 1019 chooses the signal wire 1065 and the signal wire 1066 with directions of CPU1003. The output signal of the selector 1019 passes along the signal wire 1067, and is inputted into LUT1020 of the next step.

[0053]When LUT1020 outputs picture information to the printer section 2, it changes the signal of the input signal line 1067 according to the characteristic of a printer.

[0054]The selector 1021 chooses either signal of the output signal line 1068 of LUT1020, and the signal wire 1065 with directions of CPU1003. The output signal of the selector 1021 is inputted into the expansion circuit 1022 of the next step.

[0055]The expansion circuit 1022 can set magnifying power as the direction of X, and the direction independence of Y with the directions from CPU1003. The expansion method is the primary linear interpolation method. The output signal of the expansion circuit 1022 is inputted into the buffer 1010 through the signal wire 1070.

[0056]The signal of the signal wire 1070 inputted into the buffer 1010 passes along the bidirectional signal wire 1057 with directions of CPU1003, via the connector 1001, is sent to the printer section 2 and printed out.

[0057]Hereafter, the flow of the signal of the core part 10 and each part is explained.

[0058]First, operation of the core part 10 using the information on the computer interface part 7 is explained.

[0059]The computer interface part 7 performs an interface with the computer connected to the external device 3. The computer interface part 7 is provided with two or more interfaces which perform communication with SCSI, RS232C, and the Centronics system. The computer interface part 7 has three kinds of above-mentioned interfaces, and the information from each interface is sent to CPU1003 via the connector 1007 and the data bus 1054. CPU1003 performs various kinds of control from the sent contents.

[0060]Next, operation of the core part 10 using the information on the image memory part 9 is explained.

[0061]First, the case where information is outputted to the image memory part 9 is explained.

[0062]Via communication IC1002, CPU1003 performs CPU122 of the reader section 1, and communication, and issues a manuscript scan command. The reader section 1 is read when the scanner unit 104 scans a manuscript with this command, and it outputs picture information to the connector 120. The reader section 1 and the external device 3 are connected by the cable. The information from the reader section 1 is inputted into the connector 1001 of the core part 10. The picture information inputted into the connector 1001 is sent to LUT1011 via the signal line 1057 of 8 bits of multiple values, and the buffer 1010.

[0063]The output signal of LUT1011 is transmitted to the image memory part 9 as multi valued image information via the signal wire 1059, the selectors 1013, 1014, and 1016, and the

connector 1009. The picture information memorized by the image memory part 9 is sent to CPU1003 via CPU bus 1054 of the connector 1009. CPU1003 transmits the data sent to the computer interface part 7 mentioned above from the image memory part 9. The computer interface part 7 is transmitted to a computer with the interface for which it asks among three kinds of above-mentioned interfaces (SCSI, RS232C, Centronics).

[0064]Next, the case where the information from the image memory part 9 is received is explained.

[0065]First, picture information is sent to the core part 10 from a computer via the computer interface part 7. If CPU1003 of the core part 10 judges that the data sent via CPU bus 1054 from the computer interface part 7 is data about the image memory part 9, it will be transmitted to the image memory part 9 via the connector 1009. Next, the image memory part 9 transmits an 8-bit multi valued signal to the selector 1014 and the selector 1017 via the signal wire 1064 via the connector 1009.

[0066]In rotating the picture of the image memory part 9 to the printer section 2 with directions of CPU1003 and outputting, it carries out the rotating process of the signal 1064 inputted into the selector 1014 in the rotary circuit 1015. The output signal 1062 from the rotary circuit 1015 is inputted into LUT1020 via the selector 1016 and the selectors 1017 and 1019. Since LUT1020 outputs the picture of the image memory part 9 to the printer section 2 by the concentration considered as a request, the table of LUT1020 can be changed by CPU1003.

[0067]The output signal 1068 of LUT1020 is inputted into the expansion circuit 1022 via the selector 1021. The expansion circuit 1022 carries out expanding processing of the 8-bit multiple value with the primary linear interpolation method. The 8-bit multi valued signal which has a value from [ many of ] the expansion circuit 1022 is sent to the reader section 1 via the buffer 1010 and the connector 1001.

[0068]The reader section 1 inputs this signal into the external I/F switching circuit 119 via the connector 120. The external I/F switching circuit 119 inputs the signal from the image memory part 9 into Y-signal generation and the color detection circuit 113. After the output signal from Y-signal generation and the color detection circuit 113 is carried out in processing which was described above, it is outputted to the printer section 2 and image formation is performed on an output paper.

[0069]Next, the computer interface part 7 is explained using drawing 5.

[0070]The connector A700 and the connector B701 are connectors for SCSI interfaces. The connector C702 is a connector for Centronics interfaces. The connector D703 is a connector for a RS232C interface. The connector E707 is a connector for connecting with the core part 10.

[0071]In connecting the apparatus which has two connectors (the connector A700, the connector B701), and has two or more SCSI interfaces, it carries out cascade connection of the SCSI interface using the connector A700 and the connector B701. In connecting a computer with the external device 3 by 1 to 1, a computer is connected with the connector A700 by a cable, and a terminator is connected to the connector B701, or a computer is connected with the connector B701 by a cable, and it connects a terminator to the connector A700.

[0072]The information inputted from the connector A700 or the connector B701 is inputted into SCSI-I/F-A704 or SCSI-I/F-B708 via the signal line 751. SCSI-I/F-A704 or SCSI-I/F-B708 output data to the connector E707 via the signal line 754, after performing procedure by a SCSI protocol.

[0073]The connector E707 is connected to CPU bus 1054 of the core part 10. CPU1003 of the core part 10 receives the information inputted into the connector for SCSI-I/F

(the connector A700, the connector B701) from CPU bus 1054.

[0074]When outputting the data from CPU1003 of the core part 10 to a SCSI connector (the connector A700, the connector B701), a procedure contrary to the above performs.

[0075]It is connected to the connector C702 and a Centronics interface is inputted into Centronics I/F705 via the signal line 752. Centronics I/F705 receives data by the procedure of the decided protocol, and outputs it to the connector E707 via the signal line 754.

[0076]The connector E707 is connected to CPU bus 1054 of the core part 10.

CPU1003 of the core part 10 receives the information inputted into the connector for Centronics I/F (connector C702) from CPU bus 1054.

[0077]It is connected to the connector D703 and a RS232C interface is inputted into RS232C and I/F706 via the signal line 753. RS232C and I/F706 receive data by the procedure of the decided protocol, and outputs it to the connector E707 via the signal line 754.

[0078]The connector E707 is connected to CPU bus 1054 of the core part 10.

CPU1003 of the core part 10 receives the information inputted into RS232C and the connector for I/F (connector D703) from CPU bus 1054.

When outputting the data from CPU1003 of the core part 10 to RS232C and the connector for I/F (connector D703), a procedure contrary to the above performs.

[0079]Next, the image memory part 9 is explained based on drawing 6.

[0080]It is connected with the core part 10 by the connector 900, and the image memory part 9 exchanges various signals. The multiple-value input signal 954 is memorized by the memory 904 under control of the memory controller 905.

[0081]The mode in which the memory controller 905 exchanges the data of the memory 904 and CPU bus 957 with directions of CPU906, It has three functions in the mode in which the signal 954 is memorized in the memory 904 under control of the timing generating circuit 902, and the mode which reads the contents from the memory 904 and is outputted to the signal line 955.

[0082]The memory 904 has the capacity of 32Mbytes and memorizes the picture of A three-phase-circuit this with the resolution of 400dpi, and 256 gradation. The timing generating circuit 902 is connected with the connector 900 by the signal line 952.

It is started by the control signal (HSYNC, HEC, VSYNC, VEN) from the core part 10, and the signal for attaining the two following functions is generated.

[0083]The 1st is the function to memorize the information from the core part 10 in the memory 904.

The 2nd is the function to transmit picture information to the read signal line 955 from the memory 904.

[0084]CPU906 of the image memory part 9 is connected to the dual port memory 903 via CPU1003 of the core part 10, and the signal line 957 via the signal line 953. Each CPU exchanges a command via this dual port memory 903.

[0085]By instructions of CPU906, the bias detector circuit 907 detects the bias angle of the picture memorized by the memory 904, and transmits the result to CPU906. The rotary circuit 908 rotates the free angle of the picture memorized by the memory 904 by instructions of CPU. The bias detector circuit 907 and the rotary circuit 908 are mentioned further later.

[0086]Next, picture information is accumulated in the image memory part 9, and the example of

operation which transmits this information to a computer is explained. The 8-bit multi value image signal from the reader section 1 is inputted from the connector 900, and is inputted into the memory controller 905 via the signal line 954. With the signal 952 from the core part 10, the memory controller 905 generates the timing signal 956 in the timing generating circuit 902, and memorizes the signal 954 in the memory 904 according to this signal.

[0087]Here, if bias detection is needed, CPU906 will detect a bias angle by the bias detector circuit 907, and will obtain the result. And by the rotary circuit 908, CPU906 rotates the picture memorized by the memory 904 so that a bias angle may be amended.

[0088]CPU906 connects the memory 904 of the memory controller 905 to CPU bus 957. CPU906 reads image information from the memory 904 one by one, and transmits it to the dual port memory 903. CPU1003 of the core part 10 reads the image information of the dual port memory 903 of the image memory part 9 via the signal line 953 and the connector 900, and transmits this information to the computer interface part 7. Since it has already explained, it omits transmitting information to a computer from the computer interface part 7.

[0089]Next, the example of operation which outputs the image information sent from the computer to the printer section 2 is explained.

[0090]The image information sent from the computer is sent to the core part 10 via the computer interface part 7.

[0091]CPU1003 of the core part 10 transmits image information to the dual port memory 903 of the image memory part 9 via CPU bus 1054 and the connector 1009.

[0092]At this time, CPU906 controls the memory controller 905 and connects CPU bus 957 to the bus of the memory 904.

[0093]CPU906 transmits image information to the memory 904 via the memory controller 905 from the dual port memory 903. If it finishes transmitting image information to the memory 904, CPU906 will control the memory controller 905 and will connect the data line of the memory 904 to the signal 955.

[0094]CPU906 performs CPU1003 of the core part 10, and communication via the dual port memory 903, and performs setting out for carrying out the print output of the picture to the printer section 2 through the core part 10 from the memory 904.

[0095]After this setting out is completed, CPU906 applies starting to the timing generating circuit 902, and outputs a predetermined timing signal to the memory controller 905 from the signal line 956.

[0096]The memory controller 905 reads image information from the memory 904 synchronizing with the signal from the timing generating circuit 902, transmits it to the signal line 955, and is outputted to the connector 900.

[0097]Since the core part 10 explained, it omits, until it outputs to the printer section 2 from the connector 900.

[0098]Hereafter, the bias detector circuit 907 and the arbitrary gyros-angularis revolution way 908 which serve as the feature in the example of this invention are explained.

[0099]Drawing 7 is a flow chart which shows operation of the bias detector circuit 907.

[0100]First, in S1001, the picture is scanned, the connectivity of the black pixel of a picture is investigated, and it expresses with the minimum rectangle that adjoins a linked black pixel (drawing 8). Next, in S1002, a rectangular relation (vertical and horizontal adjoining interval) is investigated, and a document judges vertical writing or lateral writing. And in S1003, if a document is lateral writing and it is a portion under a rectangle, and vertical writing, a right portion will be connected in a straight line, and a bias angle will be obtained, comparing it with

the reference horizon or a perpendicular line.

[0101]As other examples of the bias detector circuit 907, level and the line which becomes vertical can be entered in the specific portion of the manuscript to read to a manuscript, it can be read together with a manuscript, the line can be detected in a bias detector circuit, and a bias angle can also be obtained as compared with a reference line.

[0102]In this case, although a line must be written in a manuscript, unlike a previous example, it can respond also to pictures other than a document image.

[0103]Next, the example of the arbitrary gyros-angularis revolution way 908 is explained. This is expressed with the formula of the coordinate conversion shown in drawing 9 when an angle of rotation is set to s.

[0104]First, skewing correction memorizes the picture read by the scanner part 1 to the image memory part 9 through the core part 10, as mentioned above. Here, a bias angle is detected by the bias detector circuit 907, and it rotates so that a bias angle may be amended by the rotary circuit 908. And it is outputted to the interface part 7.

[0105]Proper spin compensation will be automatically performed and outputted about the manuscript which carried out bias delicately by this, and the accuracy of reading in OCR etc. can be improved easily.

[0106]Next, the example of the output of the arbitrary gyros-angularis revolution way 908 is explained.

[0107]First, the picture read by the scanner part 1 is memorized to the image memory part 9 through the core part 10, as mentioned above. Here, only the angle specified beforehand is rotated and it is outputted to the interface part 7 by the rotary circuit 908.

[0108]The angle turning around a picture shall be set up by the predetermined key operation of the final controlling element 124, etc. The accuracy of reading in OCR etc. can be easily improved because this sets up and copies the degree of correction angle arbitrarily about the manuscript which carried out bias.

## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1]It is a block diagram showing the composition of the whole in the example of this invention.

[Drawing 2]It is a sectional view showing the structure of the above-mentioned example.

[Drawing 3]It is a block diagram showing the circuitry of the reader section in the above-mentioned example, and a printer section.

[Drawing 4]It is a block diagram showing the composition of the external device in the above-mentioned example.

[Drawing 5]It is a block diagram showing the composition of the computer interface part in the above-mentioned example.

[Drawing 6]It is a block diagram showing the composition of the image memory part in the above-mentioned example.

[Drawing 7]It is a flow chart which shows operation of the bias detector circuit in the above-mentioned example.

[Drawing 8]It is an explanatory view showing an example of the picture which carries out angle correction in the above-mentioned example.

[Drawing 9]It is an explanatory view showing the coordinate transformation equation used in the

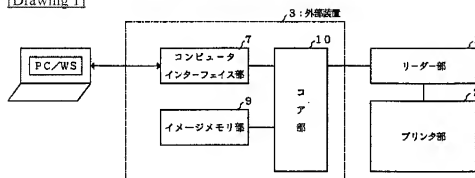
above-mentioned example in a rotary circuit.

[Description of Notations]

- 1 -- Reader section
- 2 -- Printer section
- 3 -- External device,
- 7 -- Computer interface part,
- 9 -- Image memory part
- 10 -- Core part
- 907 -- Bias detector circuit,
- 908 -- Arbitrary gyros-angularis revolution way.

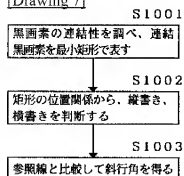
## DRAWINGS

[Drawing 1]



0625001

[Drawing 7]

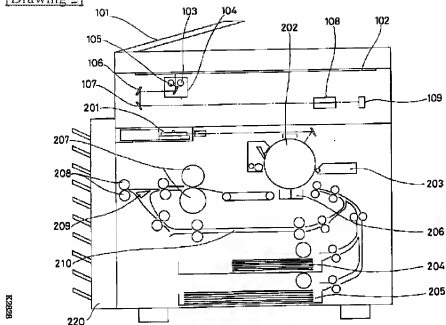


[Drawing 8]

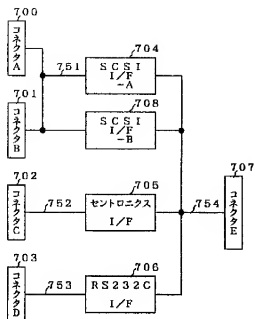


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[Drawing 2]



[Drawing 5]



K2828

[Drawing 9]

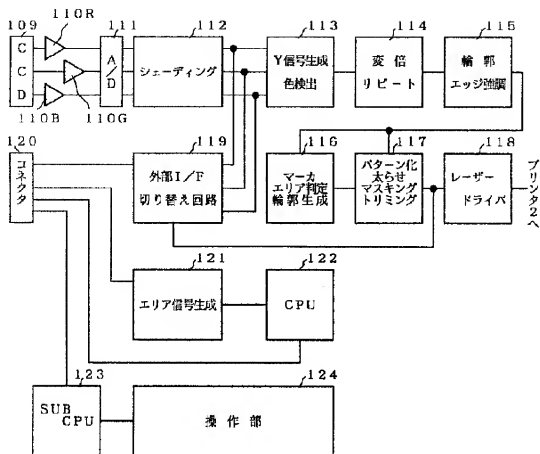
$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} \cos(s) & \sin(s) \\ -\sin(s) & \cos(s) \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix}$$

( $x, y$ ): 元の座標

( $x', y'$ ): 変換後の座標

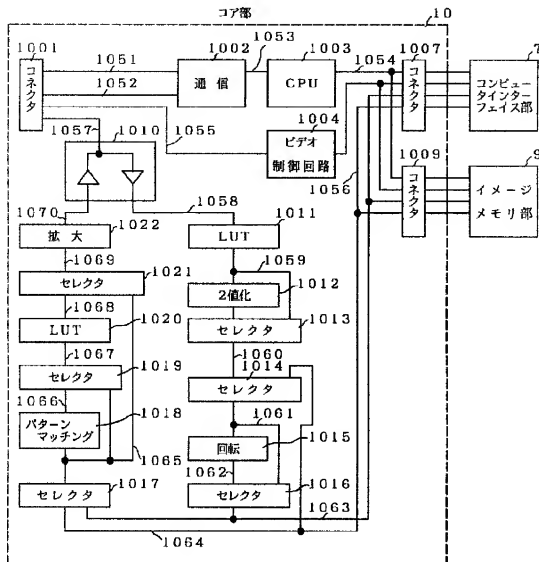
K2828

[Drawing 3]



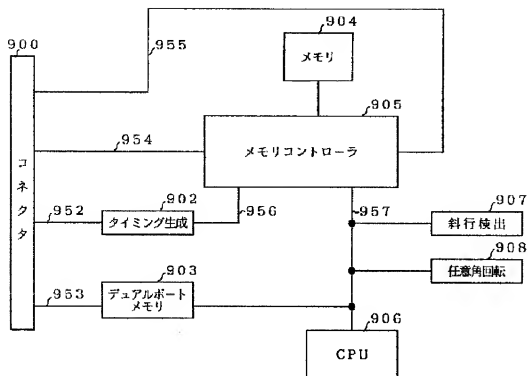
K2828

[Drawing 4]



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[Drawing 6]



K2828

[Translation done.]

Your Ref: 07844-249JP1  
Our Ref: PA941

**Translation of Selected Portions of  
Pat. Laid-open Official Gazette**

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Appln. No: 6-78024  
Appln. Date: March 24, 1994  
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Inventor(s): Ichika Suzuki, Akihiko Sakai, Michiko  
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Attorney(s): Shinichi Kawakubo  
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1. Title of the Invention

IMAGE PROCESSING APPARATUS

2. Claims

(omitted)

3. Detailed Description of the Invention (Selected Portions)

1)

(omitted)

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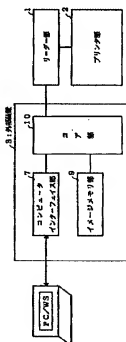
最終頁に続く

## (54) 【発明の名称】 画像処理装置

## (57) 【要約】

【目的】 原稿の斜行を容易に補正でき、外部装置における文書処理精度を上げるとともに、外部での処理の負担を軽減できる画像処理装置を提供することを目的とする。

【構成】 画像読取り装置1に画像の斜行を検出する斜行検出回路907と画像を任意の角度に回転することが出来る任意角回転回路908を設け、検出した斜行を回転させて補正したり、原稿をユーザの所望とする角度に回転させてから、コンピュータ等の外部装置に転送するようにした。



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## 【特許請求の範囲】

【請求項1】 画像を入力する画像入力手段と、入力画像を記憶する記憶手段と、入力画像の斜行を検出する検出手段と、画像の任意回転を行う画像回転手段と、画像の出力を行う画像出力手段とを有し、前記画像入力手段より入力されて画像記憶手段に記憶した画像に対し、斜行検出手段により、画像の斜行を検出し、検出された斜行を補正するように画像回転手段により画像を回転し、回転された画像を画像出力手段に出力することを特徴とする画像処理装置。

【請求項2】 請求項1において、前記画像入力手段は、光学的画像読取り装置であることを特徴とする画像処理装置。

【請求項3】 請求項1において、前記画像入力手段は、外部装置とのインターフェイス手段を有し、外部装置から画像を入力するものであることを特徴とする画像処理装置。

【請求項4】 請求項1において、前記画像出力手段は、プリンタ装置であることを特徴とする画像処理装置。

【請求項5】 請求項1において、前記画像出力手段は、外部装置とのインターフェイス手段を有し、外部装置へ画像を出力するものであることを特徴とする画像処理装置。

【請求項6】 原稿画像を読み取る画像読取り手段と、その読み取った画像を記憶する記憶手段と、画像の任意回転を行う画像回転手段と、外部装置とのインターフェイス手段とを有し、

前記画像読取り手段により読み取った画像を画像記憶手段に記憶し、画像回転手段により予め指定された角度に回転してから、インターフェイス手段により外部装置に出力することを特徴とする画像処理装置。

## 【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、画像の回転処理を行う画像処理装置に関するものである。

【0002】

【従来の技術】 近年、情報処理装置の飛躍的な発達により、文書の個人レベルでの高度な作成が可能となっており、また、その要求も高まっている。それに伴い、スキャナ等の画像読取り装置で画像を読み取り、それを加工して文書に組み込む機会も増えてきた。

【0003】 さらに、現在では読み取った原稿から、文字を認識して、コードに変換すること（これを一般的に、「OCR」という）も可能となっており、さらに原稿のハンドリングが良くなっている。

【0004】

【発明が解決しようとする課題】 しかし、OCRを行おうとする際に、原稿がある角度より大きく斜行している場合には、認識するための1つ1つの文字を切り出す

ことができず、結果的に認識することができなかった。また、高度な文書編集への要求により、読み取る画像にも水平性等の精度が要求されるようになってきた。

【0005】 したがって、このような場合には、原稿を読取り装置にかける際に、水平性等を非常に気を付けなければならなかった。

【0006】 また、読み取った画像を適当な角度（90度、180度等）に回転させた画像のみが必要な場合でも、一旦画像をコンピュータに読み込んでからコンピュータ内で回転していたので、非常に手間がかかり、無駄が多かった。

【0007】 本発明は、原稿の斜行を容易に補正でき、外部装置における文書処理精度を上げるとともに、外部での処理の負担を軽減できる画像処理装置を提供することを目的とする。

【0008】

【課題を解決するための手段】 本発明は、画像読取り装置に画像の斜行検出手段と画像を任意の角度に回転させることができる画像回転手段を設け、検出した斜行を回転させて補正することにより、画像の精度を上げることができる。これにより、原稿を画像読取り装置にセットする際に、オペレータが画像の斜行に神経質になって原稿を適正にセットするための手間を軽減し、さらに、その後の処理（例えばOCR）の精度を向上させることができる。

【0009】 また、画像回転手段により、ユーザの所望とする角度に回転させてから、コンピュータに転送することにより、コンピュータ側の手間と無駄を軽減できる。

【0010】

【実施例】 図1は、本発明の一実施例を示す画像形成システムの構成を示すブロック図である。

【0011】 図1において、リーダー1は、原稿を画像データに変換する画像入力装置であり、プリンタ部2は、複数種類の記録紙カセットを有し、プリント命令により画像データを記録紙上に可視像として出力する画像出力装置である。

【0012】 また、外部装置3は、リーダー1と電気的に接続されたものであり、各種の機能を有する。すなわち、この外部装置3には、コンピュータと接続するためのコンピュータインターフェイス部7、リーダー1からの情報を蓄積したり、コンピュータから送られてきた情報を一時的に蓄積するためのイメージメモリ部9、および上記各機能を制御するコア部10等を備えている。

【0013】 以下、詳細に各部の機能を説明する。

【0014】 まず、リーダー1について説明する。

【0015】 図2は、リーダー1およびプリンタ部2の構成を示す断面図である。

【0016】 原稿給送装置101上に蓄積された原稿は、1枚ずつ順次原稿台ガラス面102上に搬送され

る。そして、原稿がガラス面102の所定位置へ搬送され、スキャナ部のランプ103が点灯し、かつスキャナユニット104が移動して原稿を照射する。原稿の反射光は、ミラー105、106、107、およびレンズ108を介してCCDイメージセンサ部109（以下、CCDという）に入力される。

【0017】図3は、上記リグ部1の信号処理回路の構成を示すブロック図である。

【0018】CCD109に照射された原稿の反射光は、ここで光电変換され、レッド、グリーン、ブルーの各色の電気信号に変換される。CCD109からのカラー情報は、次の増幅器110R、110G、110BでA/D変換器111の入力信号レベルに合わせて増幅される。

【0019】A/D変換器111からの出力信号は、シェーディング回路112に入力され、ここでランプ103の配光ムラや、CCDの感度ムラが補正される。シェーディング回路112からの信号は、Y信号生成・色検出回路113および外部I/F切り替え回路119に入力される。

【0020】Y信号生成・色検出回路113は、シェーディング回路112からの信号について以下の式で演算を行い、Y信号を得る。

【0021】 $Y = 0.3R + 0.6G + 0.1B$

さらに、R、G、Bの信号から7つの色に分離し、各色に対する信号を出力する色検出回路を有する。Y信号生成・色検出回路113からの出力信号は、変倍・リビート回路114に入力される。スキャナユニット104の走査スピードにより駆走査方向の変倍を行い、変倍・リビート回路114により走査方向の変倍を行う。また、変倍・リビート回路114により複数の同一画像を出力することが可能である。

【0022】輪郭・エッジ強調回路115は、変倍・リビート回路114からの信号の高周波成分を強調することにより、エッジ強調および輪郭情報を得る。輪郭・エッジ強調回路115からの信号は、マーカエリア判定・輪郭生成回路116とパターン化・太らせ・マスキング・トリミング回路117に入力される。

【0023】マーカエリア判定・輪郭生成回路116は、原稿上の指定された色のマーカベンで書かれた部分を読み取り、マーカの輪郭情報生成し、次のパターン化・太らせ・マスキング・トリミング回路117で、この輪郭情報から太らせやマスキングやトリミングを行う。また、Y信号生成・色検出回路113からの色検出信号によりパターン化を行う。

【0024】パターン化・太らせ・マスキング・トリミング回路117からの出力信号は、レーザドライバ回路118に入力され、各種処理された信号をレーザを駆動するための信号に変換する。レーザドライバ118の出力信号は、プリンタ2に入力され、可視像として画像形

成が行われる。

【0025】次に、外部装置とのI/Fを行う外部1/F切り替え回路119について説明する。

【0026】外部1/F切り替え回路119は、リグ部1から画像情報を外部装置3に出力する場合、パターン化・太らせ・マスキング・トリミング回路117からの画像情報をコネクタ120に出力する。

【0027】また、外部装置3からの画像情報をリグ部1に入力する場合、外部切り替え回路119は、コネクタ120からの画像情報をY信号生成・色検出回路113に入力する。

【0028】上記の各画像処理は、CPU122の指示により行われ、かつCPU123によって設定された値によりエリア生成回路121は、上記画像処理に必要な各種タイミング信号を生成する。さらに、CPU122に内蔵されている通信機能を用いて外部装置3との通信を行う。SUBCPU123は、操作部124の制御を行うとともに、SUBCPU123に内蔵されている通信機能を用いて外部装置3との通信を行う。

【0029】次に、図2を参照してプリンタ部2の構成および動作について説明する。

【0030】プリンタ部2に入力された画像信号は、露光制御部201にて変調された光信号に変換されて感光体202を照射する。この照射光によって感光体202上に作られた潜像は、現像部203によって現像される。上記現像像の先端とタイミングを合わせて転写紙積載部204、もしくは205より転写紙が搬送され、転写部206において、上記現像された像が転写される。

【0031】転写された像は、定着部207にて転写紙に定着された後、排紙部208より装置外部に排出される。排紙部208から出力された転写紙は、ソート220でソート機能が働いている場合には、各ビンに排出され、またソート機能が働いていない場合には、ゾータの最上位のビンに排出される。

【0032】続いて、順次読み込む画像を1枚の出力用紙の両面に出力する方法について説明する。

【0033】定着部207で定着された出力用紙を、一度、排紙部208まで搬送後、用紙の搬送向きを反転して搬送方向切り替え部材209を介して再給紙用被転写紙積載部210に搬送する。次の原稿が準備されると、上記プロセスと同様にして原稿画像が読み取られるが転写紙については再給紙用被転写紙積載部210より給紙されるので、結局、同一出力紙の表面、裏面に2枚の原稿画像を出力することができる。

【0034】次に、外部装置3について説明する。外部装置3は、リグ1とケーブルで接続され、外部装置3内のコア部で信号の制御や、各機能の制御を行う。

【0035】この外部装置3内には、コンピュータとのインターフェイスを行うコンピュータ・インターフェイス部7と、リグ部1からの情報を蓄積したり、コンピ

ュータから送られてきた情報を一時的に蓄積するためのイメージメモリ部9と、上記各機能を制御するコア部10等が設けられている。

【0036】まず、コア部10について説明する。

【0037】図4は、上述のコア部10の詳細構成を示すブロック図である。

【0038】コア部10のコネクタ1001は、リーダー部1のコネクタ120とケーブルで接続される。このコネクタ1001には、4種類の信号線が内蔵されており、信号線1057は、8ビット多値のビデオ信号線である。信号線1055は、ビデオ信号を制御する制御信号線である。信号線1051は、リーダー1内のCPU122と通信を行う信号線であり、信号線1052は、リーダー1内のSUBCPU123と通信を行う信号線である。

【0039】そして、信号線1051と信号線1052は、通信用IC1002で通信プロトコル処理され、CPU1053を介してCPU1003に通信情報を伝達するものである。

【0040】また、信号線1057は、双方向のビデオ信号ラインであり、リーダー1からの情報をコア部10で受け取ることや、コア部10からの情報をリーダー1に出力することが可能である。

【0041】この信号線1057は、バッファ1010に接続され、ここで双方向信号から片方向の信号の信号線1058と信号線1070に分離される。

【0042】信号線1058は、リーダー1からの8ビット多値のビデオ信号の信号線であり、次のLUT1011に8ビット多値のビデオ信号を出力する。LUT1011では、リーダー1からの画像情報をルックアップテーブルにより所望するレベルに変換する。LUT1011からの出力信号線1059の信号は、二値化回路1012または、セクタ1013に入力される。

【0043】二値化回路1012には、信号線1059の多値の信号を固定のスライスレベルで二値化する単純二値化機能、スライスレベルが注文画面の回りの画素の値から変動する変動スライスレベルによる二値化機能、および誤差拡散法による二値化機能を有する。二値化された情報は、0の時00H、1の時FFHの多値信号に変換され、次のセクタ1013に入力される。セクタ1013は、LUT1011からの信号か、または二値化回路1012の出力信号かいずれかを選択する。セクタ1013からの出力信号線1060の信号は、セクタ1014に入力される。

【0044】セクタ1014は、コンピュータインターフェイス部7、イメージメモリ部9からのビデオ信号出力をそれぞれにコネクタ1007、1009を介してコア部10に入力された信号の信号線1064の信号と、セクタ1013の出力信号線1060の信号とをCPU1003の指示により選択する。

【0045】セクタ1014の出力信号線1061の信号は、回転回路1015、またはセクタ1016に入力される。回転回路1015は、入力した画像信号を+90度、-90度、+180度に回転する機能を有する。回転回路1015は、リーダー1から出力された情報を二値化回路1012で二値信号に変換した後、回転回路1015にリーダー1からの情報として記憶する。

【0046】次に、CPU1003からの指示により回転回路1015は、記憶した情報を回転して読み出す。セクタ1016は、回転回路1015の出力信号線1062と、回転回路1015の入力信号線1061のどちらかの信号を選択し、信号線1063の信号として、コンピュータインターフェイス部とのコネクタ1007、イメージメモリ部9とのコネクタ1009、およびセクタ1017に出力する。

【0047】信号線1063は、コア部10からコンピュータインターフェイス部7、イメージメモリ部9へ画像情報の転送を行う同期式8ビットの片方向ビデオバスであり、信号線1064は、コンピュータインターフェイス部7、イメージメモリ部9から画像情報の転送を行う同期式8ビットの片方向ビデオバスである。

【0048】上記の信号線1063と信号線1064の同期式バスの制御を行っているのがビデオ制御回路1004であり、ビデオ制御回路1004からの出力信号線1056の信号により制御を行う。コネクタ1007、コネクタ1009には、ほかに信号線1054がそれぞれ接続される。

【0049】信号線1054は、双方向の16ビットCPUバスであり、非同期式によるデータ、コマンドのやり取りを行う。コンピュータインターフェイス部7、イメージメモリ部9とコア部10との情報の転送は、上記の2つのビデオバス1063、1064とCPU1054によって可能である。

【0050】コンピュータインターフェイス部7、イメージメモリ部9からの信号線1064の信号は、セクタ1014とセクタ1017に入力される。セクタ1014は、CPU1003の指示により信号線1064の信号を次の回転回路1015に入力する。

【0051】セクタ1017は、信号線1063と信号線1064との信号のいずれかをCPU1003の指示により選択する。セクタ1017の出力信号線1065は、パターンマッチング回路1018とセクタ1019に入力される。パターンマッチング回路1018は、入力信号線1065の信号を予め決められたパターンとパターンマッチングを行い、パターンが一致した場合、予め決められた多値の信号を信号ライン1066に出力する。また、パターンマッチングで一致しなかった場合は、入力信号線1065の信号を信号線1066に出力する。

【0052】セクタ1019は、信号線1065と信

号線1066をCPU1003の指示により選択する。セレクト1019の出力信号は、信号線1067を通り、次段のLUT1020に入力される。

【0053】LUT1020は、プリンタ部2に画像情報を出力する際にプリンタの特性に合わせて入力信号線1067の信号を変換する。

【0054】セレクト1021は、LUT1020の出力信号線1068と信号線1065のいずれかの信号をCPU1003の指示により選択する。セレクト1021の出力信号は、次段の拡大回路1022に入力される。

【0055】拡大回路1022は、CPU1003からの指示により、X方向、Y方向独立に拡大倍率を設定することが可能である。拡大方法は、1次の線形補間方法である。拡大回路1022の出力信号は、信号線1070を通過してバッファ1010に入力される。

【0056】バッファ1010に入力された信号線1070の信号は、CPU1003の指示により双方向信号線1057を通過して、コネクタ1001を介しプリンタ部2に送られるプリントアウトされる。

【0057】以下、コア部10と各部との信号の流れを説明する。

【0058】まず、コンピュータインターフェイス7の情報によるコア部10の動作を説明する。

【0059】コンピュータインターフェイス部7は、外部装置3に接続されるコンピュータとのインターフェイスを行う。コンピュータインターフェイス部7は、SCSI、RS232C、セントロニクス系との通信を行う複数のインターフェイスを備えている。コンピュータインターフェイス部7は、上記の3種類のインターフェイスを有し、各インターフェイスからの情報は、コネクタ1007とデータバス1054を介してCPU1003に送られる。CPU1003は、送られてきた内容から各種の制御を行う。

【0060】次に、イメージメモリ部9の情報によるコア部10の動作を説明する。

【0061】まず、イメージメモリ部9に情報を出力する場合について説明する。

【0062】CPU1003は、通信IC1002を介して、リダ部1のCPU122と通信を行い、原稿スキャン命令を出す。リダ部1は、この命令により原稿をスキャナユニット104がスキャンすることにより読み取り、画像情報をコネクタ120に出力する。リダ部1と外部装置3は、ケーブルで接続されており、リダ部1からの情報は、コア部10のコネクタ1001に入力される。コネクタ1001に入力された画像情報は、多値8ビットの信号ライン1057、バッファ1010を介してLUT1011に送られる。

【0063】LUT1011の出力信号は、信号線1059、セレクト1013、1014、1016、コネク

タ1009を介してイメージメモリ部9へ、多値画像情報として転送される。イメージメモリ部9に記憶された画像情報は、コネクタ1009のCPUバス1054を介してCPU1003に送られる。CPU1003は、上述したコンピュータインターフェイス部7にイメージメモリ部9から送られてきたデータを転送する。コンピュータインターフェイス部7は、上記した3種類のインターフェイス(SCSI、RS232C、セントロニクス)のうちで所望するインターフェイスでコンピュータに転送する。

【0064】次に、イメージメモリ部9からの情報を受け取る場合について説明する。

【0065】まず、コンピュータインターフェイス部7を介してコンピュータから画像情報がコア部10に送られる。コア部10のCPU1003は、コンピュータインターフェイス部7からCPUバス1054を介して送られてきたデータが、イメージメモリ部9に関するデータであると判断すると、コネクタ1009を介し、イメージメモリ部9に転送する。次にイメージメモリ部9は、コネクタ1009を介して8ビット多値信号を信号線1064を介して、セレクト1014、セレクト1017に伝送する。

【0066】CPU1003の指示によりプリンタ部2にイメージメモリ部9の画像を回転して出力する場合に、セレクト1014に入力した信号1064を回転回路1015で回転処理する。回転回路1015からの出力信号1062はセレクト1016、セレクト1017、1019を介してLUT1020に入力される。LUT1020は、イメージメモリ部9の画像をプリンタ部2に所望とする濃度で出力するために、LUT1020のテーブルはCPU1003で変更可能となっている。

【0067】LUT1020の出力信号1068は、セレクト1021を介して拡大回路1022に入力される。拡大回路1022は、8ビット多値を1次の線形補間法により拡大処理する。拡大回路1022からの多くの値を有する8ビット多値信号は、バッファ1010とコネクタ1001を介してリダ部1に送られる。

【0068】リダ部1は、この信号をコネクタ120を介して外部1/4切り替え回路119に入力する。外部1/4切り替え回路119は、イメージメモリ部9からの信号をY信号生成・色検出回路113に入力する。Y信号生成・色検出回路113からの出力信号は、前記のような処理をされた後、プリンタ部2に出力され出力用紙上に画像形成が行われる。

【0069】次に、コンピュータインターフェイス部7について図5を用いて説明する。

【0070】コネクタA700およびコネクタB701は、SCSIインターフェイス用のコネクタである。コネクタC702は、セントロニクスインターフェイス用

コネクタである。コネクタD703は、RS232Cインターフェイス用コネクタである。コネクタE707は、コア部10と接続するためのコネクタである。

【0071】SCSIインターフェイスは、2つのコネクタ（コネクタA700、コネクタB701）を有し、複数のSCSIインターフェイスを有する機器を接続する場合には、コネクタA700、コネクタB701を用いてカスケード接続する。また、外部装置3とコンピュータを1対1で接続する場合には、コネクタA700とコンピュータをケーブルで接続し、コネクタB701には、ターミナリティを接続するか、コネクタB701とコンピュータをケーブルで接続し、コネクタA700にターミナリティを接続する。

【0072】コネクタA700またはコネクタB701から入力される情報は、信号ライン751を介してSCSI・I/F-A704またはSCSI・I/F-B708に入力される。SCSI・I/F-A704またはSCSI・I/F-B708は、SCSIのプロトコルによる手続きを行った後、データを信号ライン754を介してコネクタE707に出力する。

【0073】コネクタE707は、コア部10のCPUBus1054に接続されており、コア部10のCPU1003は、CPUBus1054からSCSI・I/F用コネクタ（コネクタA700、コネクタB701）に入力された情報を受け取る。

【0074】また、コア部10のCPU1003からのデータをSCSI・コネクタ（コネクタA700、コネクタB701）に出力する場合は、上記と逆の手順によって行う。

【0075】セントロニクスインターフェイスは、コネクタC702に接続され、信号ライン752を介してセントロニクスI/F705に入力される。セントロニクスI/F705は、決められたプロトコルの手順によりデータの受信を行い、信号ライン754を介してコネクタE707に出力する。

【0076】コネクタE707は、コア部10のCPUBus1054に接続されており、コア部10のCPU1003は、CPUBus1054から、セントロニクスI/F用コネクタ（コネクタC702）に入力された情報を受け取る。

【0077】RS232Cインターフェイスは、コネクタD703に接続され、信号ライン753を介してRS232C・I/F706に入力される。RS232C・I/F706は、決められたプロトコルの手順によりデータの受信を行い、信号ライン754を介してコネクタE707に出力する。

【0078】コネクタE707は、コア部10のCPUBus1054に接続されており、コア部10のCPU1003は、CPUBus1054からRS232C・I/F用コネクタ（コネクタD703）に入力された情報を

受け取る。また、コア部10のCPU1003からのデータをRS232C・I/F用コネクタ（コネクタD703）に出力する場合は、上記と逆の手順によって行う。

【0079】次に、イメージメモリ部9について図6に基づき説明する。

【0080】イメージメモリ部9は、コネクタ900でコア部10と接続され各種信号のやり取りを行う。多値入力信号954は、メモリコントローラ905の制御下でメモリ904に記憶される。

【0081】メモリコントローラ905は、CPU906の指示により、メモリ904とCPUバス957のデータのやり取りを行うモードと、タイミング生成回路902の制御下で信号954をメモリ904に記憶するモードと、メモリ904から内容を読み出し、信号ライン955に出力するモードの3つの機能を有する。

【0082】メモリ904は、32Mbytesの容量を有し、400dpiの解像度、および256階調でA3相当の画像を記憶する。タイミング生成回路902は、コネクタ900と信号ライン952で接続されており、コア部10からの制御信号（HSYNC、HET、VSYNC、VEN）により起動され、下記の2つの機能を達成するための信号を生成する。

【0083】1つ目は、コア部10からの情報をメモリ904に記憶する機能であり、2つ目は、メモリ904から画像情報を読み出し信号ライン955に伝送する機能である。

【0084】デュアルポートメモリ903は、信号ライン953を介してコア部10のCPU1003、信号ライン957を介してイメージメモリ部9のCPU906が接続されている。各々のCPUは、このデュアルポートメモリ903を介してコマンドのやり取りを行う。

【0085】また、斜行検出回路907は、CPU906の指令により、メモリ904に記憶された画像の斜行角を検出し、その結果をCPU906に伝送する。回転回路908は、CPUの指令により、メモリ904に記憶された画像の任意角度の回転を行う。斜行検出回路907および回転回路908については、さらに後述する。

【0086】次に、イメージメモリ部9に画像情報を蓄積し、この情報をコンピュータに転送する動作例を説明する。リーダ部1からの8bit多値画像信号は、コネクタ900より入力され信号ライン954を介しメモリコントローラ905に入力される。メモリコントローラ905は、コア部10からの信号952によってタイミング生成回路902でタイミング信号956を生成し、この信号に従って信号954をメモリ904に記憶する。

【0087】ここで、斜行検出を必要とするならば、CPU906は、斜行検出回路907により斜行角を検出

し、その結果を得る。そして、CPU906は、回転回路908により、メモリ904に記憶された画像を斜行角を補正するように回転させる。

【0088】CPU906は、メモリコントローラ905のメモリ904をCPUバス957に接続する。CPU906は、メモリ904から順次イメージ情報を読み出しデュアルポートメモリ903に転送する。コア部10のCPU1003は、イメージメモリ部9のデュアルポートメモリ903のイメージ情報を信号ライン953、コネクタ900を介して読取り、この情報をコンピュータ・インターフェイス部7に転送する。コンピュータ・インターフェイス部7からコンピュータに情報を転送することは、既に説明しているので省略する。

【0089】次に、コンピュータから送られてきたイメージ情報をプリンタ部2に出力する動作例を説明する。

【0090】コンピュータから送られて来たイメージ情報は、コンピュータ・インターフェイス部7を介してコア部10に送られる。

【0091】コア部10のCPU1003は、CPUバス1054およびコネクタ1009を介してイメージメモリ部9のデュアルポートメモリ903にイメージ情報を転送する。

【0092】このときCPU906は、メモリコントローラ905を制御し、CPUバス957をメモリ904のバスに接続する。

【0093】CPU906は、デュアルポートメモリ903からイメージ情報をメモリコントローラ905を介してメモリ904に転送する。メモリ904へイメージ情報を転送し終ると、CPU906は、メモリコントローラ905を制御し、メモリ904のデータラインを信号955に接続する。

【0094】CPU906は、デュアルポートメモリ903を介してコア部10のCPU1003と通信を行い、メモリ904からコア部10を通りプリンタ部2に画像をプリンタ出力するための設定を行う。

【0095】この設定が終了すると、CPU906は、タイミング生成回路902に起動をかけ、信号ライン956から所定のタイミング信号をメモリコントローラ905に出力する。

【0096】メモリコントローラ905は、タイミング生成回路902からの信号に同期してメモリ904からイメージ情報を読み出し、信号ライン955に伝送し、コネクタ900に出力する。

【0097】コネクタ900からプリンタ部2に出力するまでは、コア部10で説明したので省略する。

【0098】以下、本発明の実施例において特徴となる斜行検出回路907および任意角回転回路908について説明する。

【0099】図7は、斜行検出回路907の動作を示すフローチャートである。

【0100】まず、S1001において、画像を走査し、画像の黒画素の連結性を調べ、連結黒画素を隣接する最小の矩形で表す(図8)。次に、S1002において、矩形の関係(上下左右の隣接関係)を調べ、文書が縦書きか横書きかを判定する。そして、S1003において、文書が横書きならば、矩形の下の部分、縦書きならば、右の部分を通直線をつないで行き、それを参照水平線または垂直線と比較し、斜行角を得る。

【0101】斜行検出回路907の他の例としては、読み取る原稿の特定の部分に、原稿に対して水平、垂直となる線を記入し、それを原稿と一緒に読取り、その線を斜行検出回路の中で検出し、参照線と比較して斜行角を得ることもできる。

【0102】この場合には、原稿に線を書き込まなければならないが、先の実施例とは異なり、文書画像以外の画像にも対応できる。

【0103】次に、任意角回転回路908の例について説明する。これは、回転角を $\theta$ とした場合、図9に示す座標変換の式で表される。

【0104】斜行補正は、まず、スキャナ部1で読み取られた画像を、上述したようにコア部10を通してイメージメモリ部9に記憶する。ここで、斜行検出回路907により斜行角が検出され、回転回路908により斜行角が補正されるように回転される。そして、インターフェイス部7に出力される。

【0105】これにより、微妙に斜行した原稿について、自動的に適正な回転補正が施されて出力されることになり、OCR等における読取り精度を容易に向上できる。

【0106】次に、任意角回転回路908の出力の例について説明する。

【0107】まず、スキャナ部1で読み取られた画像を、上述したようにコア部10を通してイメージメモリ部9に記憶する。ここで、回転回路908により、予め指定された角度だけ回転され、インターフェイス部7に出力される。

【0108】なお、画像を回転する角度は、操作部124の所定のキー操作等により、設定されるものとする。これにより、斜行した原稿について、任意に補正角度を設定して複写することで、OCR等における読取り精度を容易に向上できる。

【0109】

【発明の効果】以上説明したように、本発明によれば、画像読取り装置に斜行検出回路および回転回路を設けることにより、斜行を補正して外部装置に出力することから、外部装置での文書処理精度を上げ、かつ外部での処理の負担を軽減できる効果がある。

【0110】また、本発明によれば、指定した角度画像を回転してから外部装置に出力することから、外部装置での文書処理精度を上げ、かつ外部での処理の負担を軽減

減できる効果がある。

【図面の簡単な説明】

【図1】本発明の実施例における全体の構成を示すブロック図である。

【図2】上記実施例の構造を示す断面図である。

【図3】上記実施例におけるリーダ部およびプリンタ部の回路構成を示すブロック図である。

【図4】上記実施例における外部装置の構成を示すブロック図である。

【図5】上記実施例におけるコンピュータインターフェイス部の構成を示すブロック図である。

【図6】上記実施例におけるイメージメモリ部の構成を示すブロック図である。

【図7】上記実施例における斜行検出回路の動作を示す\*

\*フローチャートである。

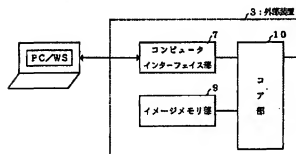
【図8】上記実施例において角度補正する画像の一例を示す説明図である。

【図9】上記実施例において回転回路で使用する座標変換式を示す説明図である。

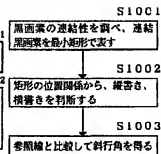
【符号の説明】

- 1…リーダ部、
- 2…プリンタ部、
- 3…外部装置、
- 7…コンピュータインターフェイス部、
- 9…イメージメモリ部、
- 10…コア部、
- 907…斜行検出回路、
- 908…任意角回転回路。

【図1】



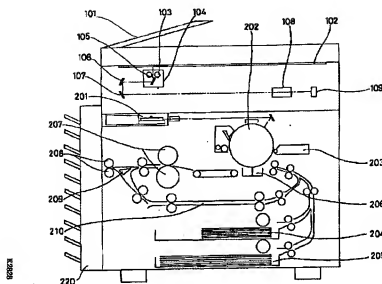
【図7】



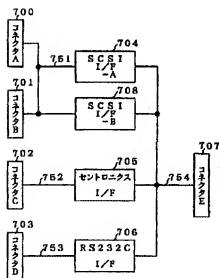
【図8】



【図2】



【図5】

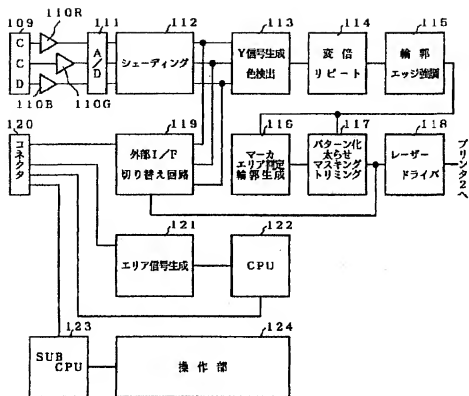


【図9】

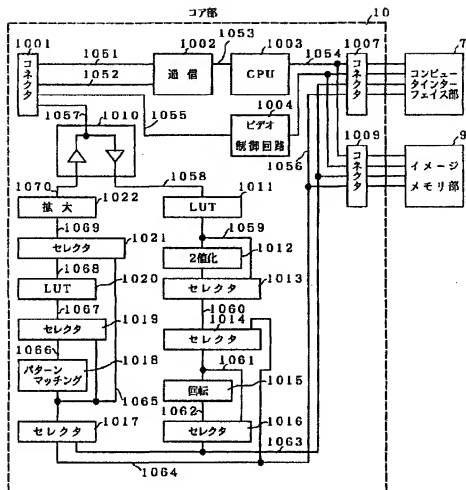
$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} \cos(\theta) & \sin(\theta) \\ -\sin(\theta) & \cos(\theta) \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix}$$

$(x, y)$  : 元の座標  
 $(x', y')$  : 変換後の座標

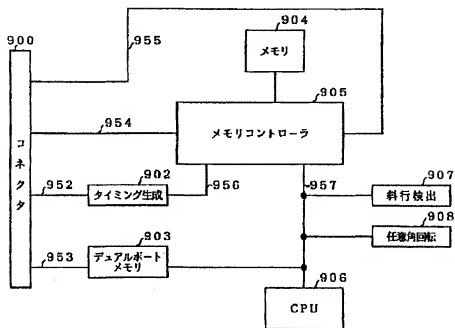
【図3】



【図4】



【図6】



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